The Forty-Second Annual Report

OF THE

UNIVERSITY OF MARYLAND

Agricultural Experiment Station

College Park, Prince George County, Maryland

1928-1929

PUBLISHED BY THE STATION

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The University of Maryland
Agricultural Experiment Station

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L. W. Ingham, M.S., Assistant (Dairy Production).
R. C. Munkwitz, M.S., Assistant (Market Milk).
M. H. Berry, M.S., Assistant Dairy Husbandry.

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A. L. Schrader, Ph.D., Pomologist.
S. W. Wentworth, M.S., Assistant Pomologist.
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PLANT PATHOLOGY.

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C. E. Temple, M.S., Plant Pathologist.
R. A. Jehle, Ph.D., Associate.

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Geo. D. Quigley, B.S., Assistant.

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Ruth M. Mostyn, Assistant Analyst.
Constance Church, B.S., Assistant Analyst.
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Elizabeth Shank, Assistant.

The Station is located on the B. & O. R. R., City and Suburban Electric Car Line and the Baltimore-Washington Boulevard, eight miles north of Washington, D. C. Bell Telephone—Berwyn Exchange.

Visitors will be welcome at all times, and will be given every opportunity to inspect the work of the Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge, to all residents of the State who request them.

ADDRESS:
AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MARYLAND.

UNIVERSITY OF MARYLAND
AGRICULTURAL EXPERIMENT STATION

Volume 42 1928-1929

THE FORTY-SECOND ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

For the fiscal year ending June 30, 1929

By H. J. PATTERSON, Director

To the Governor of Maryland, the Board of Regents, and the President of the University of Maryland:

Gentlemen: In accordance with the federal statutes relating to and making appropriations for Agricultural Experiment Stations there is submitted herewith a report upon the work and expenditures of the Maryland Station for the fiscal year ending June 30, 1929.

It will be noted from the list of publications and projects submitted herewith that a number of investigations have been completed and some new projects inaugurated. Some of the federal acts circumscribe the nature of the work which can be done under the appropriations and also require that certain funds be devoted to fundamental research.

CONTRIBUTIONS MADE TO AGRICULTURE DURING THE YEAR

The following reports of progress on the projects seem worthy of special note at this time:

AGRICULTURAL ECONOMICS:

This division has completed several studies during the year. Some of the completed projects have been distributed as bulletins and others are ready for the press.

Prices of Farm Products:

A historical study of prices of farm products from 1851 to 1925 made in cooperation with the Agronomy Department and the United States Department of Agriculture has made it possible to construct a State Index Number of farm prices. This data also shows the cycles in farm commodities and the changes which have taken place in cropping systems and methods.

Retail Markets:

A study of the retail margins in food products in Washington, D. C., has given information as to the variations between commodities and between stores. The conclusions drawn are: (1) Margins are affected by size and value of the retail unit, (2) Number of retail units in the wholesale package, (3) Location of stores and the services rendered, and (4) By rapidity of turnover and volume of business; the study also indicates that the producer, retailer and consumer benefit in selling those packages which are put up on the farm.

Wheat Markets:

A study of the destination and uses of Maryland wheat was made in cooperation with the Agronomy Department. This study covered four phases: (1) The production, consumption, and sale of wheat, (2) The uses and movement of wheat, (3) The consumption of flour, (4) The influence of quality, storage facilities and changes in market tendencies.

Maryland produces about ten million bushels annually, about one-half of which is shipped out of the state. About one-half of that shipped out of Maryland, or 2,500,000 bushels go to southern mills.

This condition made it desirable to test the feasibility of grading and inspecting wheat at shipping points on the Eastern Shore so that the wheat could go direct to the mills and save the expenses of one shipment to the big central markets. Flour from Maryland's soft wheat is especially suited for cakes and crackers.

Marketing Potatoes on the Eastern Shore:

This study was made in cooperation with the United States Department of Agriculture. A preliminary mimeographed report has been sent to 5000 farmers.

The Supply and Distribution of Maryland Strawberries survey has been made in cooperation with the Horticulture Department. The results are ready for press and will be published in Bulletin No. 315. It covers soils, culture, varieties, cost of production and harvesting.

AGRONOMY (CROPS AND SOILS):

The wheat breeding work by both hybridization and selection is developing promising varieties and strains. The yields of the new varieties are much above present levels, and if they continue their performance, will materially benefit the wheat growers as they are probably adapted to nearly one-half of the wheat acreage of Maryland.

Sugar corn breeding and seed production has made very substantial progress. A new variety called "Hopeland," has been developed. It does not meet all the specifications desired, yet comparative tests have shown many points in its favor. The average of three years tests of Hopeland at College Park gave 27% higher yields than Stowell's. It has been tested by canners on the Piedmont soils, the limestone soils of Frederick County, and on the Eastern Shore. It met with such favor that these canners saved more than 100 bushels for seed and more than 500 acres of it was grown in 1929. The seed is being distributed in cooperation with the Tri-State Canners' Association.

Hopeland is a big, high-yielding, with a heavy cut of corn per ton. The grain is white and reasonably tender, but not as sweet as some of the standard varieties. It can probably be further improved in uniformity and sweetness. If it continues in favor, in a few years it will occupy about 15,000 acres in Maryland.

Work is in progress for the production of an earlier variety with the vigor of Hopeland, so as to lengthen the canning season. This project is also giving some indication of the establishment of some new fundamental principles in the relationship, transfer and storage of plant substances.

ANIMAL DAIRY HUSBANDRY:

A test of the Effect of Castration on Market Lambs gave for the carcass a higher grade for the wethers than for the rams. In general, the palatability of the roast shoulders gave no difference.

A study of Ground vs. Unground Soybean Hay for Dairy Cows showed that the gain in product was not justified by the expenses involved in grinding.

Advanced Registry Records:

2 Ayrshire, 3 Jersey and 5 Guernsey cows of the Station herd completed satisfactory records. The best milk record was 10338 pounds made by a four-year-old Ayrshire, and the best butter record was 547 pounds made by a two-year-old Guernsey. This Guernsey stood second in milk production with 9545 pounds. These records were made by milking twice per day and the cows were kept with the balance of the herd.

ANIMAL PATHOLOGY AND BACTERIOLOGY:

There has been inaugurated under the auspices of this department a series of investigations on abortion in dairy cows and related conditions. This disease is of great economic importance to the dairy interest. This department also has under way some promising investigations on blackhead in turkeys. Blackhead is the most serious trouble that the turkey raiser has to contend with. This, too, is of much economic importance considering the recent growth and extent of the industry.

Insect Control:

Much progress has been made in the control of insects. Two bulletins have been issued, 308 on Pyrethrum Soaps as an insecticide, and 310, The Insecticidal Properties of Oxidation Products of Petroleum. These are both valuable contributions.

Results with Vegetable and Canning Crops:

Seeding, fertilizer, and cultural experiments with peas showed that four bushels of seed per acre gave the best yields. Early planting is essential for good yields and quality. Successively later plantings gave successively smaller growth, quicker blossoming, more rapid maturity, with lower yields and quality.

The quantity of fertiziler that could profitably be used was determined to some extent by the rainfall.

Experiments with sweet potatoes showed most soils suited to this crop are acid and that application of lime was profitable and increased the crop materially. Potash produced a much greater increase in yields than either nitrogen or phosphoric acid. The best yields were obtained with a complete fertilizer high in potash.

Asparagus fertilization studies showed organic sources as better than chemicals. Nitrate of soda gave better results than sulphate of ammonia. Kainit, when used with manure gave considerable increases in yields and was much better than salt.

Fertilization of Garden Crops:

Tests covering a number of years showed that manure is valuable, but relatively expensive if it is purchased at the usual prices. It can be economically and satisfactorily replaced by the use of crop residues and commercial fertilizers.

Mineral Food Requirement of Plants:

Investigations in the department of Plant Physiology and also those with tobacco show very clearly that several mineral elements are essential to plant growth which in the past have been placed in the unessential list. The results so far show that under some conditions and on some soils that tobacco and tomato fertilization require the addition of calcium, magnesium and sulphur. In water cultures with tomatoes, the addition of boron has been proved essential. A deficiency of Potassium, "potash hunger," is indicated by a characteristic spotting of the leaves. A deficiency of phosphorus is indicated by a purple green foliage and, in water cultures, the roots elongate and turn an unhealthy brown.

A deficiency of nitrogen is indicated by a retarding of growth and a yellowing of the plant.

A lack of sulphur is indicated by the tips of the plant becoming contorted and curving downward and backward.

Need for magnesium is indicated by dead and bruised areas on the petioles.

Seed Testing:

Each year emphasizes the importance of good seed. The quality of seed is the first essential in a good crop. The cost of good seed over poor represents but a small percentage of the total cost of the crop. The results of the seed inspection seems to show that the quality offered in Maryland markets is improving. Unfair competition from outside of the state and the demand from farmers for something cheap are largely responsible for poor seed. The Maryland Seed Laboratory has given much attention to improving methods for seed testing and has modernized its equipment. The results reported by the Maryland laboratory to the Referee and Research Committee of the Association of Official Seed Analysts shows that their work is efficient.

TWENTY-FIVE-YEAR PROGRAM
FOR THE
MARYLAND AGRICULTURAL EXPERIMENT STATION

The Station Staff after much and careful consideration adopted the following as the policy and program which should be followed as far as possible:

I. Research Activities.

1. Organize the research work on a project basis, and permit contributions to the major project from any or all subject matter departments.

2. Create a general committee for each major project consisting of the Director of the Experiment Station as chairman, Head or Heads of Departments concerned, and one or more additional members representing subject matter groups.
3. The complete organization of the laboratory and field work upon the long time and upon the fundamental research basis.
   - (a) By pursuing work in only the minimum number of projects. Thus aiming to effect thoroughness and completeness in lines of work attempted.
   - (b) By making all short-time and service projects contributory to some major project, and a sub-project of the major activity.
4. Encourage and establish contacts in a cooperative way with commercial agencies. When funds for experimental purposes are made available by private grants or through commercial agencies, it is recommended that the procedure with reference to contracts as adopted by the Association of Land-Grant Colleges and Universities of November, 1928, be followed as a broad general policy, and further, that the regulations of the National Research Council be followed with reference to patents.

II. Publications.

1. Many of the Station publications on agriculture are more suitable for research workers and for institutional libraries than for farmers. Present appropriations are not sufficient to cover the cost of printing all of the manuscripts now submitted. The situation would be improved if:
   - (a) State funds were made available in sufficient amounts to meet the normal growth and expansion of the work.
   - (b) Use were made of scientific journals for the publication of strictly and primarily scientific data. This applies especially to the dissertations submitted by graduate students for the advanced degrees.
   - (c) Placing the usual Station cover on reprints of journal articles to be purchased and used in the exchange list, thus providing for full credit to the division of the University making the contribution.
   - (d) Supplements to the annual report were issued periodically to include these journal articles.

III. Equipment.

1. Buildings—It is recommended that departmental buildings, located in college unit groups, shall be the future development policy.
   - (a) This involves the restoration to agriculture of building facilities that have been provided by legislative enactment.
   - (b) Much of the lecture and laboratory work of certain departments affects all of the Colleges of the University located at College Park. If the present growth rate of the University continues then it will be necessary to provide at an early date new units for Bacteriology, Botany, Entomology, Forestry, Poultry, and Agronomy.
   - (c) Additional greenhouses are needed for all departments using this type of equipment. These new units should be so located as to provide for the necessary expansion.

2. Laboratory equipment—Each laboratory unit should have two inventories of permanent equipment, viz, one of equipment actually possessed and another of additions needed to completely equip the laboratory. This is proposed in order to avoid:
   - (a) Within a department numerous styles and types of office furniture and laboratory equipment (tables, desks, cabinets, etc.)
   - (b) The indiscriminate use and accumulation of improvised equipment installed through expediency.
   - (c) To organize properly the purchase of additional equipment.
3. Land—Suitable and adequate land has been secured for the Horticultural work. There remains, however, the necessity of providing adequate land and improvements for the work in Agronomy, Animal Husbandry, Forestry, and Poultry, and for incidental field projects of other departments. The acreages herein suggested should be regarded as minimum amounts rather than the total land acreage that could be utilized profitably.
   - (a) Agronomy.—For the department's home station work in crop production and plant breeding and soil management and soil fertility work—150 acres.
   - (b) Animal and Dairy Husbandry—For general livestock and dairying—350 to 400 acres. Except for the permanent pastures, the general fields could be utilized for the multiplication of improved varieties of grains also.
   - (c) Poultry—For Station and University teaching work in poultry production, management, and experimental projects—100 acres.
   - (d) Forestry—For Forestry teaching, demonstration and management work there should be made available at least 100 acres of woodland. This land should be located adjacent to or near the University to make it accessible to students.
   - (e) For General Projects—This land to be used for general and emergency projects and for crop production work when not required by the departments for experimental work. It should be a part of one of the above units.
   - (f) Special Station Farms—For some special studies in crops and soils, there should be available at least three farms of about 100 acres each for the investigation of soil management, soil fertility, crop rotations and cost of production. These farms might best be secured on the basis of a long time lease and a satisfactory rental. The farms should be located, one each in Southern Maryland, the Piedmont, and the Cumberland Valley.
   - (g) The present policy might be continued with respect to land leasing for short time projects.
4. Farm lands now owned by the State of Maryland and used for Public Welfare purposes should be made available for the investigation and promotion of its agricultural interests. This work to be conducted under contracts arranged by the several Boards concerned. The particular interests that might be served are:
   - (a) The livestock interests, especially with reference to the breeding and selection of animals.
   - (b) Farm and horticultural crop interests through the production and distribution of high quality seeds.
   - (c) Forestry interests, especially if used for forest nurseries and forest management purposes.

FACILITIES NEEDED FOR RESEARCH

In order to do satisfactory research and handle and solve the many problems that farmers bring to the Station it is quite essential that there should be provided more and better facilities. The following are the most outstanding needs at present:

1. Land. There is only about 80 acres of land for cultivation at College Park, belonging to the University. This is all needed for laboratory purposes for classes and research.

All of the land east of the Baltimore-Washington road which had been devoted to horticultural work was absorbed by the enlargement of the athletic field. To provide land for the horticultural work, the legislature of 1929 made an appropriation of $70,000. This was expended in the purchase of land about 2½ miles north of College Park on and east of the Boulevard, near Sunnyside Station on the B. & O. R. R. The following tracts were purchased:

The Francione property..............	49	acres
The Sunnyside Beall Property........	111	"
The Weaver farm....................	102	"
The Furbee property................	6 2-3	"
Total	268 2-3	acres

This will take care of the present need and permit of some expansion of the horticultural work. There is need of 500 to 800 acres of additional land for tests of crops, soil, fertilizers, dairy, general animal husbandry, and poultry. The land for these departments should be selected with reference to the work to be carried on, but should be located as near College Park as possible.

Much of the work in these departments is now being conducted on rented land. This is unsatisfactory for many reasons, but particularly for animal husbandry work as satisfactory buildings are not provided on rented farms and it is not advisable for the institution to construct buildings or make other investments of a permanent character. The importance of dairying in Maryland would justify having farms or barns devoted to each of the four principal dairy breeds (Holstein, Guernsey, Jersey and Ayrshire). For satisfactory work there should be herds of at least 20 to 30 of each breed.

The present equipment for work with hogs and sheep is very meager and inadequate. Their importance merits proper recognition. Few people recognize the important place which poultry occupies in Maryland and realize that the gross returns are nearly as great as from the dairies. Exact data is not available but considering investment, and general overhead, the net returns from poultry is probably greater than from cows. This condition would warrant much better equipment and more men and money devoted to poultry research.

In addition to the land for the purposes mentioned it is very necessary to provide proper barns and other equipment.

2. Laboratories. All of the departments need more space for research and better equipped laboratories. For some kinds of work it is desirable to have a number of small specialized laboratories rather than large laboratories. Research can not be conducted satisfactorily in laboratories which are equipped for and used by undergraduate classes.

The completion of the buildings now provided for the departments of Horticulture and Bacteriology will provide some of the much needed laboratory facilities.

3. Maintenance. The research work has never had as large a fund for the purchase of seeds, plants, fertilizers, machinery, livestock, feeds, repairs, travel and general supplies as is necessary for the proper conduct of the work. Many things can not be done on as large a scale or in the up to the minute manner that the importance would justify. Buildings, greenhouses, and offices should be kept in better repair and more presentable appearance. An institution of this nature should not use obsolete machinery. More travel money is necessary for the research men to keep in closer touch with the experiments being conducted in different parts of the state. Funds should also be available to send representatives to the national meetings pertaining to their special subjects and much profit would be gained by having men visit other Experiment Stations and research institutions majoring in their problems.
4. Men. Good productive research is more dependent on men than any other factor. In many respects it is more satisfactory to grow or develop men for the particular work desired than to go out and find them. In either case, after men have been procured and started on important investigations, sufficient funds should be available to pay salaries which will keep them contented and prevent other institutions from taking them away.

   Every department could profitably use more help. More full time research men should be employed. This is particularly true in the dairy and poultry departments.

   If the University courses were arranged on a quarter basis instead of the semester it would enable a more satisfactory division of the work of some men who are doing both teaching and research.
5. Guide and Demonstrator. The number of visitors to the University and Experiment Station is constantly increasing. Visitors frequently have difficulty in locating the person they desire to consult or finding the things they are interested in seeing. Such a state is unsatisfactory to the visitor and not to the advantage of the University. This condition may warrant the establishment of an Information Service in care of a well trained Guide and Demonstrator. Some institutions have provided such a service to the satisfaction of all concerned. Such a man conserves the time of the heads of departments and research workers. It is usual to assign some other duties to such an officer so as to profitably occupy his time when not needed by visitors. Such a man might do some kinds of editorial work.

LIST OF ACTIVE PROJECTS 1929-1930

There is a total of 142 projects receiving consideration at present. They are divided under 14 divisions of work as shown in the following list:

Agricultural Economics:

A-14 The marketing of livestock in Maryland with special reference to the Baltimore market.
A-16 The supply and distribution of Maryland tobacco.
A-17 Economic efficiency of the farm layout.
A-18 Organization and business analysis of Maryland farms.

Agricultural Engineering:

R-1 Electric treatment of soils.

Agronomy: Crops and Soils:

B-38 Corn, variety tests for mature corn and silage.
B-39 Wheat hybridization, head selection and head-row tests.
B-40 Oats, variety tests.

B-41 Hybridization for smooth awns on winter barley.
B-42 Hay, Forage and Pasture, Tests of seed from different sources, etc.
B-43 Annual legumes.
B-44 Sugar corn seed production and breeding.
B-45 Crop rotation. The effect of genetic equilibrium and selection upon plant breeding practice.
B-46 Wormseed project.
B-47 Studies on the reproductive capacity of the su (sugar) factor in relation to the Su (starch) factor in corn.
B-48 The effective sex ratio in corn and its relation to yield.
O-26 Soil survey and management of Maryland soils.
O-27 Field study of the fertility requirements and management of important soil types.
O-28 Fertilizer studies with early potatoes and sweet potatoes on Norfolk sandy loam.
O-29 Effect of fertilizer treatments on the quality of tomatoes.
O-30 Field tests of different fertilizers in cooperation with the Bureau of Chemistry and Soils.
O-31 Soil fertility studies in relation to tobacco brown root rot.
O-32 The fertilizer requirements of sugar corn for canning.

Animal Husbandry:

C-1 Experimental feeding trials carried on with hogs to determine the comparative value of soybean oil meal versus fishmeal as a supplement to corn, soybean hay being fed to one-half of the pigs in each experiment.
C-6 Factors affecting the quality and palatability of Maryland hams.
C-7 Effect of castration of market lambs upon the quality and palatability of meat produced.
C-8 Survey of Maryland sheep industry and correlation of the factors which determine the successful raising of sheep.
C-9 Marketing lambs at early ages.

Bacteriology and Animal Pathology:

D-22 Poultry diseases. A. Cocidiosis.
D-24 To find the lethal dose for poultry of certain drugs commonly used in treating some of the diseases to which they are subject.
D-25 The determination of the best practical methods of limiting infection and reducing exposure in infected herds where more drastic means of control are impractical.
D-26 The purchase and maintenance of a small reacting herd for the study of contagious abortion.
D-27 A study of the effects of temperature, age and shipment on the agglutination test for contagious abortion.
D-28 A study of the methods of transmission of the causative agent of Black Head in turkeys.
D-29 A study of the specificity of the agglutination test for contagious abortion.
D-30 A study of diseased tonsils removed from children drinking raw milk.
D-31 A study of the economics of clean and infected herds (contagious abortion).
D-32 Contagious abortion-survey of reacting herds to determine the relation of the titre to udder infection.
(Data reported and surveys made on the following projects as material is available.)
D-11 Value of tuberculin in the diagnosis of tuberculosis.
D-12 Tuberculosis in animals.
D-13 A study of hog cholera.

D-14 Parasitic infection in swine.
D-15 A study of forage poisoning horses.
D-16 A study of blackleg in cattle.
D-18 A study of disease in cattle due to crab grass.
D-19 A study of pyocianeus infection in the udder of cattle.
D-23 Johne's disease in cattle.

Dairy Husbandry:

G-8 Effect of the use of sharp versus dull ice cream freezer blades upon the quality of ice cream produced and upon the time and power required in its manufacture.
G-3 Establishment of a system whereby contagious abortion may be regulated and controlled.
Comparison of feeding practices in the rearing of dairy calves.
Processing chocolate milk to reduce sedimentation in the finished product.

Entomology:

H-21 Biology and control of greenhouse pests.
H-22 Repelling stable flies.
H-23 A study of laspeyresia molesta busck in Maryland.
H-24 Winter protection of bees.
H-25 Biology and control of the peach tree borer.
H-26 Dusting peach and apple trees for the control of insects and diseases.
H-27 Insecticide investigations.
H-29 Investigation of the biology and control of insects affecting canning crops.
H-30 Apple insects.
H-31 The head capsule of the soldier termite.
H-32 Biology of the lesser bee moth.
H-33 Biology of the larger cabinet beetle.

Floriculture:

I-17 A study of calyx splitting, Carnations.
I-18 Effect of soil types on yields of varieties, Carnations.
I-19 Breeding and selection, Snapdragons.
I-20 Effect of time of ripening of bulb on forcing qualities, Gladiolus.
I-21 Treatment of greenhouse soil for: a. Zinc poisoning from galvanized stakes. b. Toxicity of chrysanthemum roots on sweet peas.
I-22 Greenhouse crop fertilizers.
I-23 Dahlia variety testing.

Home Economics:

R-1 Housing in relation to farm labor turnover.
R-2 The factors affecting food consumption habits of farming people in Maryland.

Plant Pathology:

J-43 Inspection of orchards and nurseries.
J-44 Annual plant disease survey.
J-46-47 Identification of plants.
J-49 Fruit rot sclerotinias.
J-52 Maryland grasses.
J-56 Tomato leaf spot, etc.
J-61 Mycosphaerella.
J-68 Tomato Mosaic.
J-71 Apple scab.

J-72 Potato seed and mosaic control.
J-73 Bean anthracnose.
J-45 Botanical survey of Maryland.
J-51 Spraying and dusting.
J-53 Maryland trees.
J-54 Resistance to clover diseases.
J-55 Effects of chemicals on pollen.
J-57 Wilt resistance of tomatoes.
J-58 Carnation diseases.
J-60 Root rot of peas.
J-64 Dahlia diseases.
J-69 Tobacco diseases.

Plant Physiology:

K-7 Physiological and biochemical aspects of vegetable storage.
K-10 Physiological aspects of fruit storage.
K-11 A study of the pectic constituents in tomatoes with special reference to the quality of the canned product.
K-12 The chemical relation of pectin to protopectin.
K-14 Mineral nutrient requirement of the potato plant.
K-15 The relation of light, temperature and atmospheric moisture to the physiological salt balance in nutrient solutions.
K-16 Symptons of mineral nutrient deficiencies in plants, with special reference to the tomato.

Plant Propagation:

E-1 Plant propagation, with special reference to cuttings.

Pomolgy:

L-40 The breeding of blight resistant pears. College.
L-45 Fruit spur and biennial bearing studies of apples.
L-46 The effect of shade on horticulture plants, fruits, vegetables, and flowers used.
L-47 The effect of varying the length of day on plant growth and chemical composition.
L-48 The fertilization of apple orchards.
L-49 The fertilization of peach orchards.
L-50 Sod versus tillage for apple orchards.
L-52 The fertilization of strawberries.
L-53 The effect of bud and spur defoliation on fruit bud formation.
L-54 The influence of pollination on fruit yields.
L-55 Experiments in grape training and pruning.
L-56 The rejuvenation of peach orchards.
L-57 Peach pruning experiments.
L-58 The breeding of early colored grapes.
L-59 Variety tests of apples, peaches, pears, plums, and cherries.
L-60 Variety tests of grapes and strawberries.
L-61 Variety tests of bush fruits.
L-62 Transplanting studies with trees.
L-63 Collection of phenological data.
L-64 Apple breeding and testing of new seedlings.
L-65 An economic study of peach cling stone canning varieties.
L-66 An economic study of different peach planting methods.
L-67 A study of the factors influencing the red color on apples.
L-68 A study of the effect of nitrogen and other fertilizers on the firmness of the flesh, shipping quality, and keeping quality of various fruits.

L-69 Studies of the effects of different nitrogenous fertilizer on orchard fruits.
L-70 A study of the effect of potash on coloring, maturity, shipping and keeping qualities of the fruits of strawberries, peaches and apples.

Tobacco Investigations in Cooperation with the Department of Agriculture:

P-1 Tobacco breeding and variety tests.
P-2 Crop rotation tests with tobacco.
P-3 Effects of crops on yields of succeeding crops in the rotation with special reference to tobacco.
P-4 Fertilizer tests and studies in the nutrition requirements of the tobacco plant, with reference to both quality and yield of leaf tobacco.
P-5 Improved methods of handling seed beds, including steam sterilization.

Vegetable Gardening:

Q-56 Potatoes.
Q-58 Garden peas.
Q-59 Rhubarb.
Q-60 Cantaloupes.
Q-61 Sweet potatoes.
Q-62 General fertility problems.
Q-63 Testing new varieties and strains of vegetables.
Q-65 Asparagus.
Q-66 Spinach.
Q-67 Tomatoes.

New Investigations Suggested:

There comes to the Station from time to time requests for information which is not available. A satisfactory answer to these questions will require research. The experiments in progress suggest new research projects. County Agents, Home Demonstration Agents, farm organizations, and individual farmers all bring to the Station problems for investigation. These requests and suggestions are complied with in so far as facilities and funds will permit. Many of them are of much economic importance and funds should be made available for their immediate consideration. The following are a few of the suggested investigations which have come through these various sources:

1. An economical and practical means of maintaining fertility for garden crops by means of green crops and commercial fertilizers when stable manure is not available.
2. Factors affecting fruit setting in lima beans.
3. Factors influencing sex ratios in cucurbits.
4. Factors influencing the flowering and seeding of beets, turnips, and salsify.
5. The effect of rolling on root development of grasses.
6. The selection of strains and time of seeding Kentucky blue grass.
7. Tests of the use of sweet clover for breaking up the hard pan subsoil such as is found in many of the Leonardtown loam areas.
8. Test of methods for the management of alfalfa on different soils.
9. A study of aquatic insects in relation to man and domestic animals.
10. Fruit and ornamental nursery insects and their control.
11. Migratory beekeeping as a factor in economic bee management.
12. Vitamin and iodine content of Maryland tomatoes, raw and canned.
13. The milk supply of Maryland villages.
14. The influence of rural women's clubs.
15. The influence of the growth and decline of villages on farm homes.
16. Efficiency in the household.

INVESTIGATIONS SUGGESTED BY COUNTY AGENTS

February, 1929

1. A more equitable and constructive farm rental contract. (*5, 17, 20, 21)
2. Forecasting and prevention of hail storms prevalent in limited areas. (21)
3. Prevention of winter killing of alfalfa. (21)
4. Adaptability of sources and strains of Red Clover. (21)
5. Better control of Oriental Fruit Moth. (21)
6. Soil or fertility building for different types of farming. (1, 2, 5, 7, 9, 10, 22, 23)
7. Green manures suited to soil and rotations of the general farmer, dairy farmer, truck growers, and orchardist. (1)
8. Better marketing through organization and better quality of product. (6, 17, 22)
9. Increasing production of dairy cows—feed, better cows, abortion. (5, 7, 20)
10. Better marketing of canned goods. Lowering of the cost of producing canning crops. (5, 7)
11. Poultry: poor hens, poor sanitation, parasites, brooding chicks. (5)
12. Efficient use of machinery. (10)
13. Improvement in business methods and farm records and accounts. (6, 10)
14. Improvement of pastures. (2)
15. How to grow alfalfa and clovers. (2)
16. Lime in relation to truck crops. (2)
17. Development of disease resistant strains of seed. (Cantaloupes) (2)

*Suggestions made by Counties numbered in alphabetical order. No suggestions from six counties.

18. Seed treatment for the control of diseases. (Cantaloupes) (2)
19. Potato spraying for control of blight, leaf hopper and beetles. (13)
20. Budgeting of the farm cropping system. (13)
21. Is it economical to raise calves for cows? (13, 19)
22. Should dairymen balance rations and produce milk with home grown crops? (13)
23. A compilation and summarizing of the results of Station's work for use of county agents. (15)
24. Rotations with reference to feeding program. Crop Budgeting. (15)
25. More knowledge as to varieties in relation to soil and markets available. (15)
26. Shall sugar corn be planted in hills or drills for yield and quality? (20)
27. Development of better strains of evergreen corn for canning. (20)
28. Methods of marketing and grading wheat. (20)
29. Pre-Easter lambs for Eastern Shore farmers. (20)
30. Greater diversification of the farm program. (4)
31. Control of the Red Spider on strawberries and the Mexican Bean Beetle. (19, 23)
32. Cause of poor yields of grains following soybeans. (19)
33. Proper stage of development of green tomatoes for harvesting and wrapping for early market. (19)
34. Economical use of seconds and cull potatoes. (19)
35. Sources of string bean seed. (19)
36. Satisfactory late potato to take place of McCormick. (23)

PUBLICATIONS

There is much need for more funds for printing and distributing the results of investigations. Usually the amount which is available from the Maintenance fund for this purpose is not sufficient and at the end of the fiscal year there are six to twelve manuscripts ready for press which must be carried over. The President of the University secured from the Board of Regents a special allotment for this year and made possible the printing of five additional bulletins.

There is in preparation a series of bulletins giving the results of experiments on different soils and coordinating them with the soil surveys. To make these of real value to farmers will necessitate soil maps of districts and counties. The using of maps on the proper scale is more expensive than our present budget will permit. To print these bulletins alone will require at least five thousand dollars per year for several years.

The Station Staff is considering plans for a more efficient and economical distribution of the results of investigations. It is important to place the bulletins giving the results of the investigations in the hands of the people who will use and profit by them with the minimum waste. It may prove desirable to only give summaries in the popular press and reserve the bulletins for those who request them. It may be well to enlarge the sphere of some of the University's popular publications so as to include these summaries. The growth of the work and the increased demand for publications presents some real problems.

BULLETINS ISSUED IN FISCAL YEAR 1928-29

Some of the results completed during the year have been published in the bulletins and articles listed below. There are several bulletins ready for press which cannot be printed for the lack of funds.

	Pages
Bulletin 299—Peach Pruning in Maryland. By A. L. Schrader and E. C. Auchter	1-36
Bulletin 300—Potash from Industrial Alcohol. By L. B. Broughton, H. L. Marshall, N. C. Thornton	37-61
Bulletin 301—The Manufacture and Distribution of Tomatoes, Sweet Corn and Peas in Maryland. By W. J. Hart	62-145
Bulletin 302—Effect of the Mosaic Disease on Yield and Quality of Tobacco, With Suggestions for Control. By J. E. McMurtrey, Jr.	146-158
Bulletin 303—Physiological Shrinkage of Potatoes In Storage. By C. O. Appleman, W. D. Kimbrough, and C. L. Smith	159-175
Bulletin 304—An Economic Study of the Production of Tomatoes in Maryland By Wm. Paul Walker	176-238
Bulletin 305—An Economic Study of the Production of Sweet Corn and Peas in Maryland. By S. H. DeVault and Wm. Paul Walker	239-329
Bulletin 306—Factors Influencing Yield and Quality of Peas—Biophysical and Biochemical Studies. By Victor R. Boswell	340-382
Bulletin 307—A Study of Spinach Varieties with Special Reference to Their Canning Qualities. By Horace B. Farley	383-416
Bulletin 308—Insecticidal Value of Pyrethrum Soaps. By Ernest N. Cory and Norwood A. Eaton	417-428
Bulletin 309—Amounts of Fertilizer and Manure Required for Maintenance of Fertility for Vegetable Production. By T. H. White and V. R. Boswell	429-444
Bulletin 310—A Progress Report on the Testing of Sulfonated Oxidation Products of Petroleum For Their Insecticidal Properties. By J. L. Hoerner	449-465

CONTRIBUTIONS TO SCIENTIFIC MEETINGS AND JOURNALS

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Cory, E. N. Control Measures for the European Red Mite on Peach and Apple. Trans. Pen. Hort. Soc. Page 109-110. 1929.

Cory, E. N. and H. B. McDonnell. Ozone as an insecticide. J. E. E. Vol. 21, Page 510. 1929.

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Munkwitz, R. C. Dairy Cost Accounting at Maryland and other Colleges. International Association of Ice Cream Manufacturers, Washington, D. C.

Norton, J. B. S. Favorite Dahlias of 1928. 38pp. May, 1929. Published by author, Hyattsville, Md.

Schrader, A. L. Pruning and fruiting studies of the Concord grape. Proc. Amer. Soc. Hort. Sci. 25. 1928.

Upshall, W. H. and F. E. Gardner. Responses of variety and seedling roots to attempts at propagation. Proc. Amer. Soc. Hort. Sci. 25. 1928.

Waite, R. H. Poultry Science and Practice. (Book) McGraw-Hill Co. 1929.

Whitehouse, W. E. Nutritional studies with the strawberry. Proc. Amer. Soc. Hort. Sci. 25. 1928.

STATION STAFF

There are a number of Research Assistants on the Staff who are giving part time to research projects and at the same time taking graduate work for advanced degrees. It is expected that these men will leave when the advanced degree has been secured. In addition to these changes several of the men in major positions have resigned in order to accept places offering better salaries and advancements in other ways.

Benj. H. Bennett, M. S., resigned to accept a position in the Bureau of Agricultural Economics, U. S. Department of Agriculture. Ralph Russell, M. S., a graduate of the University of Wisconsin, was appointed to fill this vacancy.

L. W. Erdman, Ph. D., resigned to take charge of a commercial laboratory in Milwaukee, Wisconsin, for the preparation of legume inoculations. This vacancy was filled by R. P. Thomas, Ph. D., a graduate of Wisconsin University.

J. M. Snyder, B. S., resigned to become Agronomist for the Chilian Nitrate of Soda Company with headquarters in Washington, D. C. This vacancy was filled by E. H. Schmidt, M. S., a graduate of this University.

W. E. Whitehouse, Ph. D., resigned to accept a position with the Division of Foreign Plant Introduction, U. S. Department of Agriculture. This vacancy was filled by the appointment of S. W. Wentworth, M. S., of Cornell University.

V. R. Boswell, Ph. D., resigned to become Senior Olericulturist of the U. S. Department of Agriculture. The services of Dr. Boswell have been retained as a special lecturer for advanced courses.

F. W. Geise, Ph. D., resigned to become Raw Products Specialist for the American Can Company with headquarters in Rochester, N. Y.

E. C. Auchter, Ph. D., accepted an appointment with the U. S. Department of Agriculture as Horticulturist which permitted him to remain as head of our horticulture department on a part time basis. This relation has been satisfactory.

Some changes of this kind are to be expected, but this year has had more than desirable. This is particularly true in the Horticulture Department.

RESOURCES

The Experiment Station is maintained by Federal and State Appropriations. The federal acts outline the duties and functions of the Station and the State appropriations are more or less supplementary to them.

The Hatch, Adams and Purnell (Federal) funds for 1929-30 will amount to $90,000.

The State appropriations for the period 1920-1930 are shown by the following table. It will be noted that the increase made by the State in this period will not permit of much growth or expansion.

The seed "H" fund is used entirely and most of the "F" fund for regulatory work and they should not be charged strictly to research. The details as to expenditure of the funds for the last fiscal year are submitted herewith.

STATE APPROPRIATIONS FOR EXPERIMENT STATION

	Research Fund D	Ridgely Farm Fund J	Seed Inspection Fund H	Biological Laboratory Fund F
Year 1920-21	$41,900	$5,000	$ 7,000	$5,500
" 1921-22	41,900	5,000	7,000	5,500
" 1922-23	66,900	5,000	8,200	5,500
" 1923-24	66,900	5,000	8,200	5,500
" 1924-25	66,900	5,000	8,200	5,500
" 1925-26	66,900	5,000	8,200	5,500
" 1926-27	66,900	5,000	8,200	5,500
" 1927-28	66,900	5,000	9,700	5,500
" 1928-29	66,900	5,000	9,700	5,500
" 1929-30	66,900	5,000	10,000	7,500

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE UNITED STATES APPROPRIATIONS

Dr.	Hatch Fund	Adams Fund	Purnell Fund
To appropriations for fiscal year 1928-1929	$15,000.00	$15,000.00	$50,000.00
By Salaries	$14,410.77	$13,986.65	$38,056.93
Labor	......	......	3,819.73
Stationery and Office Supplies	......	22.81	69.22
Scientific Supplies, consumable	68.25	527.37	756.51
Feeding Stuffs	None	None	None
Sundry Supplies	13.64	41.50	271.45
Fertilizers	......	......	233.71
Communication Service	43.84	1.29	48.24
Travel Expenses	......	24.18	2,167.94
Transportation of Things	......	......	24.06
Publications	463.50	None	2,611.81
Heat, Light, Water and Power	......	......	74.30
Furniture, Furnishings and Fixtures	......	1.15	710.30
Library	......	5.25	19.97
Scientific Equipment	......	383.93	79.50
Livestock	......	......	873.09
Tools, Machinery and Appliances	......	5.87	156.74
Buildings and Land	......	......	26.50
Total	$15,000.00	$15,000.00	$50,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATE APPROPRIATIONS

Dr.	General Fund	Ridgely Farm
Balance July 1, 1929	......	$11.24
Recepits for year 1928-1929	$67,589.11	5,798.19
	$67,589.11	$5,809.43
Cr.		
By Salaries	$26,734.37	$1,800.00
Labor	13,189.74	2,241.50
Stationery & Office Supplies	275.07	3.00
Scientific Supplies	197.94	......
Feeding Stuffs	4,619.73	212.82
Sundry Supplies	832.21	178.27
Fertilizers	1,162.34	630.61
Communication Service	297.22	30.27
Travel Expenses	794.99	112.02
Transportation of Things	313.08	7.08
Publications	3,756.65	......
Heat, Light, Water and Power	1,711.44	14.00
Furniture, Furnishings and Fixtures	216.17	......
Library	501.48	......
Scientific Equipment	31.44	......
Livestock	......	360.00
Tools, Machinery and Appliances	2,048.57	97.25
Buildings and Land	1,045.73	226.34
Contingent Expenses	46.85	......
Insurance	6,581.26	......
Rent of Poultry Equipment	2,853.22	......
Total	$67,209.50	$5,913.16
Overdraft July 1, 1928	3,947.05	......
	$71,156.55	$5,913.16
Overdraft June 30, 1929	3,567.44*	103.73
	$67,589.11	$5,809.43

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*Due from State Treasurer.

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATION FARM FUND

Dr.

Balance July 1, 1928	$265.01
Receipts 1928-1929	30,329.12
	$30,594.13

Cr.

By Salaries	$1,761.66
Labor	12,827.70
Stationery and Office Supplies	295.59
Scientific Supplies	50.29
Feeding Stuffs	9,544.35
Sundry Supplies	1,666.85
Fertilizers	61.80
Communication Service	86.95
Travel Expenses	658.33
Transportation of Things	869.95
Publications	1,023.97
Heat, Light, Water and Power	1,462.28
Furniture, Furnishings and Fixtures	67.86
Library	90.99
Livestock	368.75
Tools, Machinery and Appliances	1,335.03
Buildings and Land	902.07
Insurance	365.75
Contingent	172.97
Total	$33,613.14
Overdraft June 30, 1929	3,019.01
	$30,594.13

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH REGULATORY AND PUBLIC SERVICE FUNDS

Dr.	Biological Laboratory	Seed Inspection	State Dairymen's Association
Receipts for year 1928-1929	$15,239.93	$9,711.41	$5,785.04
Cr.			
By Salaries	$3,760.95	$7,836.70	$2,790.79
Labor	950.00	195.63	......
Stationery and Office Supplies	16.04	384.98	......
Scientific Supplies	649.44	13.39	......
Feeding Stuffs	303.55	......	......
Sundry Supplies	5,832.68	216.79	......
Communication Service	564.43	121.50	......
Travel Expenses	......	248.98	399.14
Transportation of Things	43.42	......	......
Heat, Light, Water and Power	148.39	......	......
Furniture, Furnishings and Fixtures	15.05	598.77	......
Library	......	22.38	......
Scientific Equipment	107.00	201.83	......
Tools, Machinery and Appliances	35.74	4.61	......
Buildings and Land	40.26	54.23	......
Contingent	......	10.00	2,400.00
Totals	$12,466.95	$9,909.79	$5,589.93
Overdraft July 1, 1928	3,648.13	714.17	250.00
	$16,115.08	$10,623.96	$5,839.93
Overdraft June 30, 1929	875.15*	912.55*	54.89*
Totals	$15,239.93	$9,711.41	$5,785.04

*Due from State Treasurer.